ERA HELICOPTERS, INC.

PROCESS SPECIFICATION

Scope: This specification outlines the requirements for fabricating FRP 412 Auxiliary Fuel Tanks.

Conformation: This specification does not conform to any existing government specification.

Subcontractors: MESH PLASTICS, LTD. of Lake Charles, Louisiana, or its subcontractor shall be the only subcontractors qualified to construct the FRP requirements and shall comply with this process specification. Any deviations or variations are to be submitted to ERA for approval with proper documentation prior to fabrication.

Conflicts: In the event of a conflict with engineering drawing(s) and this specification, the drawing(s) shall govern.

Fabrication of FRP 412
Auxiliary Fuel Tanks

Rev	Date	Approvals: Manufacturing MESH	Manufacturing ERA	Quality Control MESH	Quality Control ERA	Engineering MESH	Engineering ERA	Comments
0	07/07/86							

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MATERIALS

MATERIAL	NAME	MANUFACTURER
Structural Resin	Derakane 8084	Dow Chemical Midland, MI
Corrosion Liner Resin	Derakane 470-36	Dow Chemical Midland, MI
Promoter	Cobalt Napthenate	AKZO Chemie New Brunswick, NJ
Accelerator	Dimethylaniline	Buffalo Colors West Paterson, NJ
MEKP Catalyst	Hi Point 90	Witco Chemical Richmond, CA
	Lupersol DHD 9	Lucidol Chemical Buffalo, NY
Mold Release	PVA	Rexco Carpenteria, CA
	Cerea Mold Release Wax	Ceara Products,Inc. Denver, CO
UV Inhibitor	UV-9	Industrial Chemicals Atlanta, GA
Pigment	CoPlas	CoPlas Fort Smith, AR
Putty filler (Amorphous Fumed Silica)	Aerosil	Dequssa Corp. Teterboro, NJ
	Cabosil	Cabot Corp. Boston, MA

MATERIALS

MATERIAL	NAME	MANUFACTURER
3/4 oz Type 'E' glass mat	M113 - 3/4 oz.	Certainteed Wichita Falls, TX
1-1/2 oz Type 'E' glass mat	Compatamat - 1-1/2 oz.	PPG Industries Shelby, NC
	M113 - 1-1/2 oz.	Certainteed Wichita Falls, TX
24 oz Type 'E' Woven Roving	24 oz. woven roving	Owens Corning Anderson, SC
9.52 oz Kevlar Woven Roving	K49/095	Knytex Seguin, TX
8.9 oz. Type "ECDE" glass	7781	Burlington Fibers Altavista, VA
10 mil 'C' glass, or	Modiglass	Reichold Chemical Bremen, OH
	Manville Glass	Manville Corp. Denver, CO
10 mil 'A' glass veil	Surglass	Superior Glass Bremen, OH
Paraffin Wax	TF-100	Industrial Chemicals
Grinding Discs	36 Grit Type D 60 Grit Type C 80 Grit Type C	3M Corp. St. Paul, MN
Fire Retardant Additive	Nyacol	PQ Corp. Ashland, MA
Mold surface	Black Tooling Gel	Glidden ,

Kevlar is a registered Trademark of E.I. Dupont & de Nemours & Co.

Laminate Manufacture

1) Apply mold release to mold in accordance with manufacturer's instructions.

2) Apply catalyzed Derakane 8084 resin (with UV inhibitor and pigment) and glass veil. Deaerate and wetout by rolling with serrated rollers.

3) Apply one layer of 3/4 oz type 'E' chopped strand mat. Wetout with Derakane 8084 resin (with UV inhibitor and pigment) and deaerate with serrated rollers.

4) Apply one layer of Knytex Woven Roving. Wetout with Derakane 8084 resin and deaerate with serrated rollers.

5) Apply one layer of 3/4 oz type 'E' chopped strand mat. Wetout with Derakane 8084 Resin and deaerate with serrated rollers.

6) Repeat steps #(4) and #(5) two more times for a total nominal thickness of 0.125".

7) Allow resin to gel before continuing (30 minutes minimum).

8) Apply one layer of 1-1/2 oz type 'E' chopped strand glass mat. Wetout with Derakane 470-36 resin and deaerate with serrated rollers.

9) Apply one layer of glass veil and deaerate with serrated rollers.

10) Apply "wax" coat of Derakane 470-36 resin over glass veil.

Edge Sealing: Cut edges which will remain exposed (e.g., the ends of inward projecting nozzles) should be sealed. Minimum requirement is coating with paraffinated lay-up resin.

Final Fit-Up: The pieces to be joined should be assembled with proper alignment and secured in position with jigs or "hot patches".

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ALLOWABLE DEFECTS

Defect	Surface inspected: Process Side	Surface inspected: Nonprocess Side
Cracks	None	None
Crazing (fine surface cracks)	None	Max dimension 1/2 in., max density 5 per sq. ft. min 2 in apart
Blisters(rounded elevations of the laminate surface over bubbles)	None	Max 1/4 in., dia x 1/8 in. high, max 1 per sq ft, min 2 in apart
Wrinkles and solid blisters	Max deviation, 20% of wall thickness, but not exceeding 1/8 in.	Max deviation, 20% of wall thickness but not exceeding 1/8 in.
Pits(craters in the laminate surface)	Max dimensions, 1/8 in. dia x 1/32 in. deep. Max number,10 per sq ft	Max dimensions, 1/8 in dia x 1/16 in deep, max density 10 per sq. ft.
Surface porosity(pin-holes or pores in the laminate)	None	None
Chips	None	Max dimension of break, 1/4 in, and thickness no greater than 20 percent of wall thickness, max density 1 per sq ft
Dry spot(nonwetted reinforcing)	None	Max dimension,2sq in. per sq ft
Entrapped air (bubbles or voids in the laminate)	1/16 in max dia., 10 per sq in. max density, but none to a depth of 1/32 in.	1/8 in. max dia, 4 per sq in. max density; 1/16 in. max dia. 10 per sq in. max density

ALLOWABLE DEFECTS

Defect	Surface inspected: Process Side	Surface inspected: Nonprocess Side
Exposed Glass	None	None
Burned Areas	None	None
Exposure of cut edges	None	None
Scratches	None	Max length 1 in. max depth 0.010 in.
Foreign Matter	None	1/16 in.dia, max density 1 per sq ft

ACCEPTANCE INSPECTION

It is the purpose of the inspection to verify that each tank has been fabricated in accordance with and meets the requirements of this specification.

RESPONSIBILITIES: It is the responsibility of the fabricator to make available to ERA Helicopter or his authorized representative any or all of the following:

Records: Records pertaining to the equipment being purchased shall be supplied when requested. These may include:

- Materials specifications
- Equipment drawings or mold jig
- Materials test results.
- Dimensional verification reports.
- Rework and repair reports.

EQUIPMENT: The equipment to be inspected should be properly located and positioned, and should be in condition to permit safe and thorough inspection. Reasonable means should be provided to permit the inspector to visually examine the entire inner and outer surfaces of the equipment.

The following inspection tools and equipment should be made available for use by the inspector.

- Barcol hardness tester.
- Acetone squeeze bottle with acetone.
- Extension cord with ground fault switch.
- A vapor tight inspection light.
- Thickness gauge.

ACCEPTANCE INSPECTION

TEST OF FINISHED EQUIPMENT:

The following basic tests should be included as a minimum in the Acceptance Inspection.

Barcol Hardness Test - A test of resin cure should be made in accordance with ASTM D2583.

Surface Cure Test - An acetone test should be used to detect surface inhibition on surfaces exposed to air during cure. The procedure that should be used is the following: rub a few drops of acetone on the surface and check for tackiness after the acetone has evaporated. Persistent tackiness indicates incomplete cure.

Dimensions - The inspector should be provided with copies of all approved drawings or mold jigs. Thicknesses of wall must be measured.

MATERIALS:

Raw materials used for laminates should be virgin materials and should be free of contaminants.

APPLICABLE DOCUMENTS:

ASTM Standards

C 581-74-Test Method for Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures.

D 638-77a-Test method for Tensile Properties of Plastics.

D 790-71-Test Methods for Flexural Properties of Plastics and Electrical Insulating Materials.

D 883-78a-Definitions of Terms Relating to Plastics.

D 2583-75-Test Method for Identation Hardness of Rigid Plastics by Means of a Barcol Impressor.

FIBERGLASS SURFACING MAT

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize fiberglass surfacing mat used by the fabricator.

2.0 Definitions

2.1 Fiberglass Surfacing Mat - A random arrangement of glass fibers bonded with a binder to form a thin porous mat which is supplied in roll form. Surfacing mat is usually used to reinforce the corrosion resistant resin rich liner on the inside of equipment and to provide a smooth surface on the exterior of equipment.

2.2 Binder - Chemical treatment applied to the jackstraw arrangement of glass fibers to give the mat integrity. Specific binders are utilized to promote chemical compatibility with the various laminating resins used.

2.3 Slugs - Unfiberized beads of glass.

3.0 Requirements

3.1 Visual Requirements - Each roll of fiberglass surfacing mat shall be inspected to insure it is consistent in color, texture and appearance. Any holes, cuts or visual irregularities should be removed from the mat prior to or during fabrication.

3.1.1 Slugs - Mat which contains more than four slugs per 100 lineal feet is rejectable.

3.1.2 Wrinkles - Crosswise wrinkles or waves that are visible at a 45 deg. angle and lengthwise wrinkles that can be readily flattened under pressure and that do not crease or change the dimensions of the mat are acceptable.

3.1.3 Wet Spots and Bar Marks - The mat shall be free from these defects.

3.1.4 Delamination - The mat shall not delaminate, i.e. shall not separate into layers in coming off the roll.

FIBERGLASS SURFACING MAT

3.2 Physical Properties

3.2.1 Thickness - The thickness of the mat in each roll shall be measured.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the mat unusable.

3.3.1 The mat shall be packaged in an unbroken carton as shipped from the mat manufacturer's factory. The mat used shall not be repackaged in the distribution of the mat after the manufacturer has shipped the mat.

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

(a) Form of material
(b) Manufacturer
(c) Manufacturer's product description including binder type (treatment)
(d) Manufacturer's product code
(e) Production date, if available, or production code on carton.
(f) Property measured and value recorded

* Visual inspection
* Width
* Thickness
* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number

FIBERGLASS CHOPPED STRAND MAT

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize fiberglass chopped strand mat used by the fabricator.

2.0 Definitions

2.1 Chopped Strand Mat - Chopped strand mat is made from randomly oriented glass strands which are held together in mat form using a binder. Each strand contains a sizing.

3.0 Requirements

3.1 Visual Requirements - Each roll of chopped strand mat shall be inspected to insure it is consistent in color, texture and appearance. It shall be free from surface irregularities, fluffy masses, dirt spots or other foreign material; water spots, knots, binder spots larger than 2" in diameter, clumps of strands and tears of holes which may result form removal of defects.

3.2 Physical Requirements

3.2.1 Weight - The square foot weight of the mat shall be measured for each carton of mat used. All specimens shall fall within the range specified for the product.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the mat unusable.

3.3.1 The mat shall be packaged in an unbroken carton as shipped from the mat manufacturer's factory. The mat used shall not be repackaged in the distribution of the mat after the manufacturer has shipped the mat.

FIBERGLASS CHOPPED STRAND MAT

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

(a) Form of material
(b) Manufacturer
(c) Manufacturer's product description including binder type (treatment)
(d) Manufacturer's product code
(e) Production date, if available, or production code on carton.
(f) Property measured and value recorded

* Visual inspection
* Width
* Thickness
* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number

FIBERGLASS WOVEN ROVING

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize woven roving used by the fabricator.

2.0 Definitions

2.1 Fiberglass Woven Roving - Glass fiber rovings woven into a heavy weight fabric.

2.2 Wrap Ends - The rovings which run in the longitudinal direction of the fabric, i.e., along the roll length of the fabric.

2.3 Fill Picks - The rovings which run in the transverse direction of the fabric, i.e., across the roll length of the fabric.

2.4 Leno Strands - A pair of warp ends at each edge of the woven fabric. One Leno warp end is always over each fill pick while the other Leno warp end is always under the fill pick. The Leno strands define the edges of the woven field and serve to stabilize the edges of the fabric.

3.0 Requirements

3.1 Visual Requirements

3.1.1 Dirt Spots - Defined as all foreigh matter, dirt, grease spots, etc. - The average number of dirt spots (1/16" to 3/4" in diameter) per 100 lineal feet shall be 6 or less. All rolls shall be free of dirt spots in excess of 3/4" diameter.

3.1.2 Warp Ends - All rolls shall be free of missing warp ends for more than two consecutive feet.

3.1.3 Fill Picks - All rolls shall be free of consecutive missing picks in excess of five, or more than eleven missing picks, either individual picks or any combination of individual and multiple (2, 3, 4, or 5) picks, in any consecutive 100 lineal feet.

3.1.4 Fuzz Clumps and Loops - The product is designed to exhibit proper laydown and shall be free of fuzz clumps or loops exceeding one inch in height from the surface.

FIBERGLASS WOVEN ROVING

3.2 Physical Properties

3.2.1 Thickness - The thickness of the mat in each roll of woven roving shall be measured.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the woven roving unusable.

3.3.1 The woven roving shall be packaged in an unbroken carton as shipped from the manufacturer's factory. The woven roving used shall not be repackaged in the distribution of the woven roving after the manufacturer has shipped the woven roving.

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

(a) Form of material
(b) Manufacturer
(c) Manufacturer's product description including binder type (treatment)
(d) Manufacturer's product code
(e) Production date, if available, or production code on carton.
(f) Property measured and value recorded

* Visual inspection
* Width
* Thickness
* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number

KEVLAR WOVEN ROVING

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize kevlar woven roving used by the fabricator.

2.0 Definitions

2.1 Kevlar Woven Roving - Kevlar fiber rovings woven into a heavy weight fabric.

2.2 Wrap Ends - The rovings which run in the longitudinal direction of the fabric, i.e., along the roll length of the fabric.

2.3 Fill Picks - The rovings which run in the transverse direction of the fabric, i.e., across the roll length of the fabric.

2.4 Leno Strands - A pair of warp ends at each edge of the woven fabric. One Leno warp end is always over each fill pick while the other Leno warp end is always under the fill pick. The Leno strands define the edges of the woven field and serve to stabilize the edges of the fabric.

3.0 Requirements

3.1 Visual Requirements

3.1.1 Dirt Spots - Defined as all foreign matter, dirt, grease spots, etc. - The average number of dirt spots (1/16" to 3/4" in diameter) per 100 lineal feet shall be 6 or less. All rolls shall be free of dirt spots in excess of 3/4" diameter.

3.1.2 Warp Ends - All rolls shall be free of missing warp ends for more than two consecutive feet.

3.1.3 Fill Picks - All rolls shall be free of consecutive missing picks in excess of five, or more than eleven missing picks, either individual picks or any combination of individual and multiple (2, 3, 4, or 5) picks, in any consecutive 100 lineal feet.

3.1.4 Fuzz Clumps and Loops - The product is designed to exhibit proper laydown and shall be free of fuzz clumps or loops exceeding one inch in height from the surface.

KEVLAR WOVEN ROVING

3.2 Physical Properties

3.2.1 Thickness - The thickness of the mat in each roll of kevlar woven roving shall be measured.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the kevlar woven roving unusable.
3.3.1 The kevlar woven roving shall be packaged in an unbroken carton as shipped from the manufacturer's factory. The kevlar woven roving used shall not be repackaged in the distribution of the kevlar woven roving after the manufacturer has shipped the kevlar woven roving.

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

(a) Form of material
(b) Manufacturer
(c) Manufacturer's product description including binder type (treatment)
(d) Manufacturer's product code
(e) Production date, if available, or production code on carton.
(f) Property measured and value recorded

* Visual inspection
* Width
* Thickness
* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number

ERA HELICOPTERS, INC.

PROCESS SPECIFICATION

Scope: This specification outlines the requirements for fabricating FRP 412 Auxiliary Fuel Tanks.

Conformation: This specification does not conform to any existing government specification.

Subcontractors: MESH PLASTICS, LTD. of Lake Charles, Louisiana, or its subcontractor shall be the only subcontractors qualified to construct the FRP requirements and shall comply with this process specification. Any deviations or variations are to be submitted to ERA for approval with proper documentation prior to fabrication.

Conflicts: In the event of a conflict with engineering drawing(s) and this specification, the drawing(s) shall govern.

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Fabrication of FRP 412
Auxiliary Fuel Tanks

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Rev	Date	Approvals: Manufacturing MESH	Manufacturing ERA	Quality Control MESH	Quality Control ERA	Engineering MESH	Engineering ERA	Comments
0	07/07/86							
A	09/30/86							Gen. Rev.
B	11/03/86							Gen. Rev.

MATERIALS

MATERIAL	NAME	MANUFACTURER
Structural Resin	Derakane 8084	Dow Chemical Midland, MI
Corrosion Liner Resin	Derakane 470-36	Dow Chemical Midland, MI
Promoter	Cobalt Napthenate	AKZO Chemie New Brunswick, NJ
Accelerator	Dimethylaniline	Buffalo Colors West Paterson, NJ
MEKP Catalyst	Hi Point 90	Witco Chemical Richmond, CA
	Lupersol DHD 9	Lucidol Chemical Buffalo, NY
Mold Release	PVA	Rexco Carpenteria, CA
	Cerea Mold Release Wax	Ceara Products,Inc. Denver, CO
UV Inhibitor	UV-9	Industrial Chemicals Atlanta, GA
Pigment	CoPlas pigment	CoPlas Fort Smith, AR
	Spartan pigment	Spartan Pigments Houston, TX

MATERIALS

MATERIAL	NAME	MANUFACTURER
Putty filler (Amorphous Fumed Silica)	Aerosil	Dequssa Corp. Teterboro, NJ
	Cabosil	Cabot Corp. Boston, MA
3/4 oz Type `E' glass mat	M113 - 3/4 oz.	Certainteed Wichita Falls, TX
1-1/2 oz Type `E' glass mat	Compatamat - 1-1/2 oz.	PPG Industries Shelby, NC
	M113 - 1-1/2 oz.	Certainteed Wichita Falls, TX
24 oz Type `E' Woven Roving	24 oz. woven roving	Owens Corning Anderson, SC
Kevlar Woven Roving	K 49/051	Knytex Seguin, TX
	285-38" F100 285-50" F100	Hexcel Chicago, IL
8.9 oz. Type "ECDE" glass	7781	Burlington Fibers Altavista, VA
10 mil `C' glass, or	Modiglass	Reichold Chemical Bremen, OH
	Manville Glass	Manville Corp. Denver, CO
10 mil `A' glass veil	Surglass	Superior Glass Bremen, CH

Kevlar is a registered Trademark of E.I. Dupont & de Nemours & Co.

MATERIALS

MATERIAL	NAME	MANUFACTURER
Paraffin Wax	TF-100	Industrial Chemicals Atlanta, GA
Grinding Discs	36 Grit Type D 60 Grit Type C 80 Grit Type C	3M Corp. St. Paul, MN
Fire Retardant Additive	Nyacol	PQ Corp. Ashland, MA
Mold surface	Black Tooling Gel	Glidden
Gel coat	Gel Coat	CoPlas Fort Smith, AR

Laminate Manufacture

1) Inspect mold for defects (ie. chips, cracks, crazing, etc. ...). DO Not proceed until any defect is corrected.

2) Apply mold release agent(s) according to manufacturer's instructions.

3) Apply gel-coat containing UV inhibitor onto mold using a spray gun for a nominal thickness of 10 mils.

4) Allow gel-coat to cure for 4 - 6 hours and become tack free.

5) Apply one layer of 3/4 oz. chopped strand mat on mold surfaces. Saturate with Derakane 8084 resin containing UV inhibitor and pigment. Deaerate with serrated rollers.

NOTE: Steps # 6 and 7 apply only to the 4 piece primary shell mold.

6) Assemble mold sections securely before resin gels.

7) Apply one layer of 3" wide 3/4 oz. chopped strand mat at the seams. Saturate with Derakane 8084 resin containing UV inhibitor and pigment. Deaerate with serrated rollers.

8) Apply one layer of Kevlar woven roving over entire mold surface. Saturate with Derakane 8084 resin containing UV inhibitor (NO pigment). Deaerate with serrated rollers and plastic squeegees.

9) Apply second layer of 3/4 oz. chopped strand mat over entire mold surface. Saturate with Derakane 8084 resin containing UV inhibitor (NO pigment). Deaerate with serrated rollers.

10) Apply second layer of Kevlar woven roving over entire mold surface. Saturate with Derakane 8084 resin containing UV inhibitor (NO pigment). Deaerate with serrated rollers and plastic squeegees.

11) Apply third layer of 3/4 oz. chopped strand mat over entire mold surface. Saturate with Derakane 8084 resin containing UV inhibitor (NO pigment). Deaerate with serrated rollers.

12) Apply third layer of Kevlar woven roving over entire mold surface. Saturate with Derakane 8084 resin containing UV inhibitor (NO pigment). Deaerate with serrated rollers and plastic squeegees.

Laminate Manufacture

13) Apply fourth layer of 3/4 oz. chopped strand mat over entire mold surface. Saturate with Derakane 8084 resin containing UV inhibitor (NO pigment). Deaerate with serrated rollers.

14) Allow laminate to exotherm and cool down.

15) Measure the laminate at the control points to assure a minimum thickness of 0.110" and a nominal thickness of 0.115".

16) Apply one layer of 1-1/2 oz. chopped strand mat over entire mold surface. Saturate with Derakane 470-36 resin containing UV inhibitor (NO pigment). Deaerate with serrated rollers.

17) Apply one layer of 10 mil glass veil over entire mold surface. Saturate with Derakane 470-36 resin containing UV inhibitor (NO pigment). Deaerate with serrated rollers. ~~Deaerate with serrated rollers.~~

NOTE: All internal non mold side surfaces will receive a "wax" coat of Derakane 470-36 resin after all baffles and other internals have been installed.

18) Allow laminate to exotherm and cure for a minimum of 12 hours.

19) Trim excess laminate which protrudes from the mold.

20) Separate the fabricated part from the mold.

Edge Sealing: Cut edges which will remain exposed (ie, the trimmed edges of the parts) should be sealed. Minimum requirement is coating with paraffinated lay-up resin.

Final Fit-Up: The pieces to be joined should be assembled with proper alignment and secured in position with jigs or "hot patches".

ALLOWABLE DEFECTS

Defect	Surface inspected: Process Side	Surface inspected: Nonprocess Side
Cracks	None	None
Crazing (fine surface cracks)	None	Max dimension 1/2 in., max density 5 per sq. ft. min 2 in apart
Blisters(rounded elevations of the laminate surface over bubbles)	None	Max 1/4 in., dia x 1/8 in. high, max 1 per sq ft, min 2 in apart
Wrinkles and solid blisters	Max deviation, 20% of wall thickness, but not exceeding 1/8 in.	Max deviation, 20% of wall thickness but not exceeding 1/8 in.
Pits(craters in the laminate surface)	Max dimensions, 1/8 in. dia x 1/32 in. deep. Max number,10 per sq ft	Max dimensions, 1/8 in dia x 1/16 in deep, max density 10 per sq. ft.
Surface porosity(pin-holes or pores in the laminate)	None	None
Chips	None	Max dimension of break, 1/4 in, and thickness no greater than 20 percent of wall thickness, max density 1 per sq ft
Dry spot(nonwetted reinforcing)	None	Max dimension, 2 sq in. per sq ft
Entrapped air (bubbles or voids in the laminate)	1/16 in max dia., 10 per sq in. max density, but none within 1/32" of the surface	1/8 in. max dia, 4 per sq in. max density; 1/16 in. max dia. 10 per sq in. max density

ALLOWABLE DEFECTS

Defect	Surface inspected: Process Side	Surface inspected: Nonprocess Side
Exposed Glass	None	None
Burned Areas	None	None
Exposure of cut edges	None	None
Scratches	None	Max length 1 in. max depth 0.010 in.
Foreign Matter	None	1/16 in.dia, max density 1 per sq ft

ACCEPTANCE INSPECTION

It is the purpose of the inspection to verify that each part has been fabricated in accordance with and meets the requirements of this specification.

RESPONSIBILITIES: It is the responsibility of the fabricator to make available to ERA Helicopter or his authorized representative any or all of the following:

Records: Records pertaining to the part(s) being purchased shall be supplied when requested. These may include:

- Materials specifications
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MATERIALS:

Raw materials used for laminates should be virgin materials and should be free of contaminants.

FABRICATED PARTS: The part to be inspected should be properly located and positioned, and should be in condition to permit safe and thorough inspection. Reasonable means should be provided to permit the inspector to visually examine the entire inner and outer surfaces of the part.

The following inspection tools and equipment should be made available for use by the inspector.

- Barcol hardness tester.
- Acetone squeeze bottle with acetone.
- Extension cord with ground fault switch.
- A vapor tight inspection light.
- Thickness gauge.

ACCEPTANCE INSPECTION

TEST OF FINISHED PARTS:

The following basic tests should be included as a minimum in the Acceptance Inspection.

Barcol Hardness Test - A test of resin cure should be made in accordance with ASTM D2583.

Surface Cure Test - An acetone test should be used to detect surface inhibition on surfaces exposed to air during cure. The procedure that should be used is the following: rub a few drops of acetone on the surface and check for tackiness after the acetone has evaporated. Persistent tackiness indicates incomplete cure.

Dimensions - The inspector should be provided with copies of all approved drawings or mold jigs. Thicknesses of wall must be measured.

APPLICABLE DOCUMENTS:

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D 883-78a-Definitions of Terms Relating to Plastics.

D 2583-75-Test Method for Identation Hardness of Rigid Plastics by Means of a Barcol Impressor.

FIBERGLASS SURFACING MAT

1.0 Scope

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2.2 Binder - Chemical treatment applied to the jackstraw arrangement of glass fibers to give the mat integrity. Specific binders are utilized to promote chemical compatibility with the various laminating resins used.

2.3 Slugs - Unfiberized beads of glass.

3.0 Requirements

3.1 Visual Requirements - Each roll of fiberglass surfacing mat shall be inspected to insure it is consistent in color, texture and appearance. Any holes, cuts or visual irregularities should be removed from the mat prior to or during fabrication.

3.1.1 Slugs - Mat which contains more than four slugs per 100 lineal feet is rejectable.

3.1.2 Wrinkles - Crosswise wrinkles or waves that are visible at a 45 deg. angle and lengthwise wrinkles that can be readily flattened under pressure and that do not crease or change the dimensions of the mat are acceptable.

3.1.3 Wet Spots and Bar Marks - The mat shall be free from these defects.

3.1.4 Delamination - The mat shall not delaminate, i.e. shall not separate into layers in coming off the roll.

FIBERGLASS SURFACING MAT

3.2 Physical Properties

3.2.1 Thickness - The thickness of the mat in each roll shall be measured.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the mat unusable.

3.3.1 The mat shall be packaged in an unbroken carton as shipped from the mat manufacturer's factory. The mat used shall not be repackaged in the distribution of the mat after the manufacturer has shipped the mat.

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

(a) Form of material
(b) Manufacturer
(c) Manufacturer's product description including binder type (treatment)
(d) Manufacturer's product code
(e) Production date, if available, or production code on carton.
(f) Property measured and value recorded

* Visual inspection
* Width
* Thickness
* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number

FIBERGLASS CHOPPED STRAND MAT

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize fiberglass chopped strand mat used by the fabricator.

2.0 Definitions

2.1 Chopped Strand Mat - Chopped strand mat is made from randomly oriented glass strands which are held together in mat form using a binder. Each strand contains a sizing.

3.0 Requirements

3.1 Visual Requirements - Each roll of chopped strand mat shall be inspected to insure it is consistent in color, texture and appearance. It shall be free from surface irregularities, fluffy masses, dirt spots or other foreign material; water spots, knots, binder spots larger than 2" in diameter, clumps of strands and tears of holes which may result form removal of defects.

3.2 Physical Requirements

3.2.1 Weight - The square foot weight of the mat shall be measured for each carton of mat used. All specimens shall fall within the range specified for the product.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the mat unusable.

3.3.1 The mat shall be packaged in an unbroken carton as shipped from the mat manufacturer's factory. The mat used shall not be repackaged in the distribution of the mat after the manufacturer has shipped the mat.

FIBERGLASS CHOPPED STRAND MAT

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

(a) Form of material
(b) Manufacturer
(c) Manufacturer's product description including binder type (treatment)
(d) Manufacturer's product code
(e) Production date, if available, or production code on carton.
(f) Property measured and value recorded

* Visual inspection
* Width
* Thickness
* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number

FIBERGLASS WOVEN ROVING

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize woven roving used by the fabricator.

2.0 Definitions

2.1 Fiberglass Woven Roving - Glass fiber rovings woven into a heavy weight fabric.

2.2 Wrap Ends - The rovings which run in the longitudinal direction of the fabric, i.e., along the roll length of the fabric.

2.3 Fill Picks - The rovings which run in the transverse direction of the fabric, i.e., across the roll length of the fabric.

2.4 Leno Strands - A pair of warp ends at each edge of the woven fabric. One Leno warp end is always over each fill pick while the other Leno warp end is always under the fill pick. The Leno strands define the edges of the woven field and serve to stabilize the edges of the fabric.

3.0 Requirements

3.1 Visual Requirements

3.1.1 Dirt Spots - Defined as all foreigh matter, dirt, grease spots, etc. - The average number of dirt spots (1/16" to 3/4" in diameter) per 100 lineal feet shall be 6 or less. All rolls shall be free of dirt spots in excess of 3/4" diameter.

3.1.2 Warp Ends - All rolls shall be free of missing warp ends for more than two consecutive feet.

3.1.3 Fill Picks - All rolls shall be free of consecutive missing picks in excess of five, or more than eleven missing picks, either individual picks or any combination of individual and multiple (2, 3, 4, or 5) picks, in any consecutive 100 lineal feet.

3.1.4 Fuzz Clumps and Loops - The product is designed to exhibit proper laydown and shall be free of fuzz clumps or loops exceeding one inch in height from the surface.

FIBERGLASS WOVEN ROVING

3.2 Physical Properties

3.2.1 Thickness - The thickness of the mat in each roll of woven roving shall be measured.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the woven roving unusable.

3.3.1 The woven roving shall be packaged in an unbroken carton as shipped from the manufacturer's factory. The woven roving used shall not be repackaged in the distribution of the woven roving after the manufacturer has shipped the woven roving.

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

(a) Form of material
(b) Manufacturer
(c) Manufacturer's product description including binder type (treatment)
(d) Manufacturer's product code
(e) Production date, if available, or production code on carton.
(f) Property measured and value recorded

* Visual inspection
* Width
* Thickness
* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number

KEVLAR WOVEN ROVING

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize kevlar woven roving used by the fabricator.

2.0 Definitions

2.1 Kevlar Woven Roving - Kevlar fiber rovings woven into a heavy weight fabric.

2.2 Wrap Ends - The rovings which run in the longitudinal direction of the fabric, i.e., along the roll length of the fabric.

2.3 Fill Picks - The rovings which run in the transverse direction of the fabric, i.e., across the roll length of the fabric.

2.4 Leno Strands - A pair of warp ends at each edge of the woven fabric. One Leno warp end is always over each fill pick while the other Leno warp end is always under the fill pick. The Leno strands define the edges of the woven field and serve to stabilize the edges of the fabric.

3.0 Requirements

3.1 Visual Requirements

3.1.1 Dirt Spots - Defined as all foreign matter, dirt, grease spots, etc. - The average number of dirt spots (1/16" to 3/4" in diameter) per 100 lineal feet shall be 6 or less. All rolls shall be free of dirt spots in excess of 3/4" diameter.

3.1.2 Warp Ends - All rolls shall be free of missing warp ends for more than two consecutive feet.

3.1.3 Fill Picks - All rolls shall be free of consecutive missing picks in excess of five, or more than eleven missing picks, either individual picks or any combination of individual and multiple (2, 3, 4, or 5) picks, in any consecutive 100 lineal feet.

3.1.4 Fuzz Clumps and Loops - The product is designed to exhibit proper laydown and shall be free of fuzz clumps or loops exceeding one inch in height from the surface.

KEVLAR WOVEN ROVING

3.2 Physical Properties

3.2.1 Thickness - The thickness of the mat in each roll of kevlar woven roving shall be measured.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the kevlar woven roving unusable.
3.3.1 The kevlar woven roving shall be packaged in an unbroken carton as shipped from the manufacturer's factory. The kevlar woven roving used shall not be repackaged in the distribution of the kevlar woven roving after the manufacturer has shipped the kevlar woven roving.

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

(a) Form of material
(b) Manufacturer
(c) Manufacturer's product description including binder type (treatment)
(d) Manufacturer's product code
(e) Production date, if available, or production code on carton.
(f) Property measured and value recorded

* Visual inspection
* Width
* Thickness
* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number